

**PARALONGIDORUS AUSTRALIS, A NEEDLE NEMATODE THAT MAY CAUSE
SEVERE DAMAGE TO RICE.**

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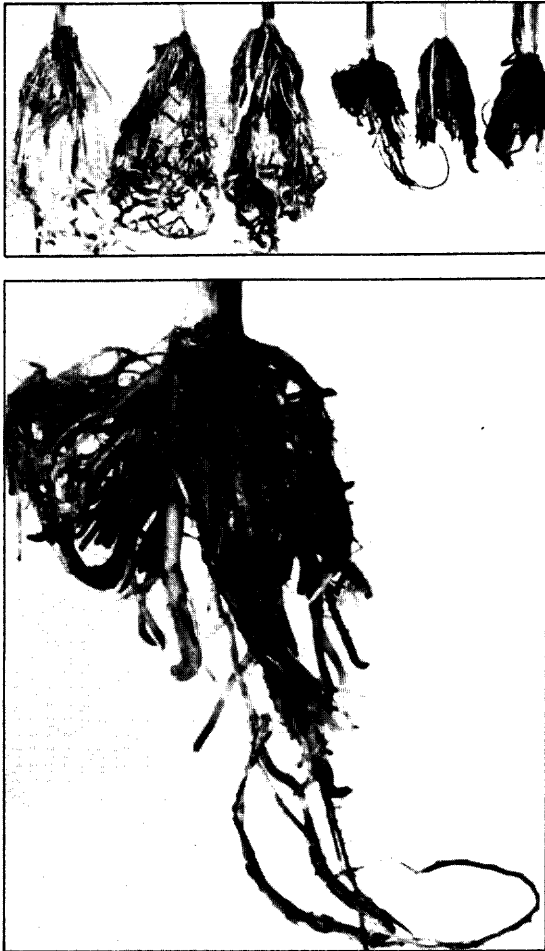


Fig. 1. Top: Roots of healthy rice seedlings (left) and seedlings damaged by rice needle nematode, *Paralongidorus australis* (right). Bottom: Root tip necrosis and curling of root tips, caused by *P. australis*.

About 12 years ago a disease of rice seedlings known as the poor growth syndrome was first observed in Queensland, Australia. In areas where the problem is severe, yield reductions as great as 50% have been observed. At first it was thought that inadequate nutrition, saline irrigation water, or insects might be responsible for the problem, but eventually it became evident that high numbers of needle nematode, *Paralongidorus australis* Stirling and McCulloch, were consistently associated with the disease. Subsequent greenhouse pathogenicity experiments established that this nematode caused symptoms on rice similar to those observed in the field. *P. australis* is restricted to northeastern Australia and the purpose of this circular is to alert rice growers regarding the symptoms and potential damage that this nematode may cause if it becomes established in rice fields in Florida or other regions.

Symptoms and Pathogenicity: In Australia populations of 100 to 1800 *P. australis*/200 ml of soil are observed in the field around the roots of diseased rice plants (3). Seedlings become stunted and chlorotic a few weeks after the rice is first flooded. Diseased plants have short, stunted primary roots with necrotic root tips which are sometimes hooked or curled (Fig. 1). New lateral roots produced above the damaged root tip also have necrotic tips. Diseased plants tend to occur in patches, giving the crop an uneven appearance. Weeds become dominant in the patches of

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diseased rice, and large water birds also tend to congregate in these areas and contribute to further crop losses (4).

In the greenhouse, rice seedlings inoculated with 250 *P. australis* per 10 g of soil had shorter leaf and root lengths than noninoculated seedlings. Compared to noninoculated plants, top and root dry weights of plants inoculated with 900 nematodes were reduced 37% and 72%, respectively. Disease symptoms observed in pathogenicity experiments were similar to those observed in the field, i.e., chlorotic leaves and stunted, necrotic roots (3).

Nematode Biology and Control: Most plant parasitic nematodes do not survive well under anaerobic conditions and flooding is sometimes a viable control option. *P. australis* appears to be relatively unique, being more active in flooded soil than in moist soil. Field observations suggest that damage to the roots of rice seedlings does not occur until large numbers of *P. australis* migrate into the root zone after soils are first flooded. In a greenhouse experiment nematodes did not move toward roots of rice seedlings in moist soil, but significant numbers were recovered from the root zone after soil was flooded for 20 and 30 days (2). The inability of *P. australis* to move in nonflooded clay soil is likely related to the fact that adults of this nematode average 104 μ m in diameter and can be up to 10 mm in length. This is 10 to 20 times longer than most plant parasitic nematodes. The pore spaces in the soils where the nematode is found in Australia are theoretically too small for nematode movement because the pore space diameters of these clay soils are smaller than the nematode's diameter. Some authors have suggested that in very wet or flooded soils large nematodes are able to push aside loosely held fine particles of soil to create larger spaces in which they can move (1,2).

Compared to many plant parasitic nematodes, rice needle nematodes survive well at a variety of soil moisture levels, and populations decline relatively slowly in the absence of a host. In a pot test, there was no significant differences in the number of nematodes recovered from soil kept dry, intermittently moist, or flooded for five months (2). Long-term fallow is not a viable control option since high numbers of infective *P. australis* were present in field soil after 14 months fallow. Nematodes also survived 5 months in concrete-like clay soil with a moisture content of 5% (2). Direct examination of dried soil clods indicated that many nematodes formed loose coils and were quiescent in dry soil. Juveniles were frequently clustered together and intertwined with coiled females, and when transferred to water, nematodes again became active (2).

At present, there are no satisfactory means of controlling the rice needle nematode. The use of tolerant or resistant rice varieties is not a feasible option because sources of resistance have not been identified among the limited number of lines that have been tested (4). Long-term crop rotation with crops such as maize, sorghum, and soybeans which are grown in nonflooded conditions and are not damaged by this nematode, is currently the best control option. However, this strategy can only be used by growers who wish to grow rice infrequently.

Some of the nonfumigant nematicides have little effect on this nematode, but other fumigants and nonfumigants, when used at relatively high rates, reduced populations of *P. australis* and the damage it caused to rice (4). Since this nematode has a long life cycle, it may take several years for populations to

reach threshold levels for economic damage following treatment. Therefore, a single application of a nematicide may provide control for two or three rice crops, but the economics of such nematicide usage are yet to be determined.

In conclusion, the rice needle nematode has certain biological characteristics that make it uniquely adapted as a parasite of paddy rice. At present its known distribution is limited to the Burdekin rice growing region of northeastern Australia. This nematode may be endemic to this region, since it has been found to be associated with certain native hosts in the natural habitats of that area (5). Rice growers in other parts of the world should be on the alert for this pest and conduct a nematode survey of any rice that has symptoms similar to those caused by *P. australis*.

LITERATURE CITED:

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